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ENTOMOLOGICAL NEWS

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ENTOMOLOGICAL NEWS

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Sawfly Genitalia: Terminology and Study Techniques

By HERBERT H. ROSS, Illinois State Natural History Survey, Urbana, Illinois

During the past two decades several hypotheses have been advanced regarding the derivation and homologies of parts of sawfly genitalia, including the genital capsule of the male and the saw of the female. The proponents of each hypothesis have frequently indicated a preference for a new or modified terminology to be applied to the various parts. In the development of the taxonomy of the sawflies, characters of both male and female genitalia have assumed continually greater importance in evaluation and diagnosis of both genera and species. With this development there has arisen a need for a stable terminology for parts of the saw and male genital capsule, a set of names which are uninomial for easy use, which apply definitely to the various parts as they exist in the group, and which can be applied by both taxonomist and morphologist regardless of differing theories of evolutionary development.

A terminology is here presented which has been designed to fill this need. The names have been selected on the following basis: (1) elimination of homonyms, that is, identical names which have previously been used for some other part of the insect body; (2) priority of uninomial latinized names, with the elimination of phrases, as a designation for well-defined morphological units; (3) tempering consideration of priority with weight of usage over a long period, or with application of a term to a homologous structure in several insect orders. The resultant terminology for the male genitalia agrees in many respects with that proposed by Crampton (1919) as enlarged

by Peck (1937), with the addition of a few names for certain parts. Many of the more recent terms proposed by Snodgrass (1941) are antedated by other available names. The terminology of the saws is a modification of that proposed by Ross (1929).

Terminology

Male Genitalia, figs. 1–5

The genitalia of male sawflies form a well-organized capsule, in repose retracted within the apical segments of the abdomen. The capsule articulates with these segments by means of a flexible membranous tube. Primitively the surface bearing the volsellae or ossicles is ventral; in certain groups, however, soon after adult emergence, the genital capsule undergoes a twisting of 180° so that this surface becomes dorsal. It is therefore convenient to orient surfaces in relation to the volsellae; the surface bearing them is the *ossicular* side, the opposite the *abossicular* side.

The genital capsule, figs. 1 and 2, is divided into four principal parts, a gonocardo, gonoforceps (paired), volsella (paired), and aedeagus. The latter three are subdivided further.

Gonocardo (*gc*).—This sclerite forms a ring around the base of the capsule. *Basal ring, cardo,* and *lamina annularis,* are other terms which have been used by various authors.

Gonoforceps.—Arising above the gonocardo is a pair of lateral clasper-like appendages. Each is a *gonoforceps.* In most sawflies the apical portion forms a distinct, articulated segment, *h,* the *harpes,* and the basal portion forms the major sclerite of the capsule, the *gonostipes* (*gs*). In some families the end of the harpes has a membranous suction organ, the *gonomacula* (*gm*). In many forms the mesal margin of the primary dorsal (abossicular) surface of the gonostipes is produced into a definite lobe, the *parapenis* (*pp*); the two opposing parapenes are partially fused at least at the base; this structure formed by the two parapenes is termed the *praeputium.*

Volsella, fig. 3.—On the primary ventral surface of the capsule is a pair of structures, separate on the meson, but each

joined laterally by membrane to the gonostipes, and frequently appearing to be implanted on their mesal surface. Each of these structures is a *volsella* (*v*). The flat basal portion of the volsella which is contiguous with the membranous edge of the gonostipes is the *basivolsella* (*bv*). The apex of the volsella bears two definite lobes, projecting beyond any membranous connection with the gonostipes, (1) a lateral *distivolsella* (*dv*) which is an unjointed continuation of the basivolsella, and (2) a mesal *gonolacinia* (*gl*), which usually articulates by a narrow membranous hinge with the basivolsella. The gonolacinia has an apical portion or *apiceps* (*ap*) and a basal prolongation or *basiura* (*ba*). The basivolsella has a longitudinal thickening, the *volsellar strut* (*vs*); its apex marks the point of closest articulation between basivolsella and gonolacinia. Snodgrass (1941) has pointed out that the distivolsella and gonolacinia are opposable, like thumb and forefinger, and function as accessory clasping organs. He proposed the names *crespis volsellaris* and *digitus volsellaris* for these two parts, respectively, but Peck's (1937) names *distivolsella* and *gonolacinia* have priority. Both writers have shown that several workers, including myself, have used the term *sagitta* erroneously for the gonolacinia. Sagitta should be restricted to the lateral sclerotized processes of the aedeagus in Apoidea.

Aedeagus (*ae*).—In the sawflies this central structure is divided into a pair of long *penis valves* (*pv*); their apex is hinged by membrane along the primary dorsal surface, but the primary ventral edges are free. Crampton proposes *penisalva* for penis valve; if a latinized term is desired, this should be employed. The term penis valve, however, has been adopted generally by almost all workers in the field.

It seems desirable at this time to propose names for certain distinctive areas of a penis valve. Each penis valve, fig. 4, has a lateral projection or *ergot* (*e*), for muscle attachment. Basal to the ergot is a tail-like portion, the *valvura* (*vr*), attached to the capsule by both muscle and membrane; beyond the ergot is the head like portion, the *valviceps* (*vc*). The valviceps has a sclerotized mesal thickening or *valvar strut* (*vv*) and may be

highly ornamented with teeth or folds. In some genera of Nematinae, fig. 5, it is definitely subdivided at the apex into a mesal flap, the *pseudoceps* (*pc*), and a lateral flap, the *paravalva* (*pr*). The latter bears at its apex a spine or spur, the *valvispina* (*va*).

Female Saw, or *Ovipositor*

The functional units of a typical sawfly ovipository apparatus have been illustrated by Snodgrass (1935, fig. 317). They consist of two pairs of valvifers which are attached to the ninth tergite and which give rise to the other parts; a saw formed by two pairs of articulated processes, one arising from each valvifer; and a sheath composed of a pair of appressed end segments of the second valvifers. The second valvifers and sheath together form a protective structure into which the hinged saw is retracted when not in use. The sheath may function also as a brace during oviposition. The sheath and saw exhibit many useful taxonomic characters.

The sheath is usually simple in structure, each half flat or convex. In certain groups there is a flange-like projection extending along the apico-ventral margin. This flange, or *scopa,* is greatly developed in the Argidae and in many genera appears to form the edge of the sheath; the primary edge is hidden within the opposed scopae.

The saw.—The dorsal pair of blades (each is a *lance,* fig. 7) are processes of the second valvifers; the ventral blades (each a *lancet,* fig. 8) are processes of the first valvifers. Along at least part of the dorsum the two lances are tightly joined by membrane or fused solidly. On each side the lance and lancet are joined together by long rod-like interlocking grooves, or *virgae* (*vi*). The virga of the lance is situated near the ventral margin on the lateral surface; the virga of the lancet is situated on the inner surface near the dorsal margin. These allow the lancet to slide back and forth. The lances are articulated at the base and swing in an arc from this stationary pivot point. At their base the two lancets are joined by membrane to a triangular external plate, or *ligamentum,* which allows some movement of the lancets back and forth under the lances.

The *lance,* fig. 7, is divided into segments by seam-like *sutures* (*s*). The large basal segment, or *radix* (*ra*), bears the articulation with the valvifer. The apical blade-like portion or *lamnium* (*la*) is usually simple in structure, with 10 to 30 segments.

The *lancet,* figs. 6 and 8, has a long membranous *radix* (*ra*) bearing the dorsal sclerotized virga and a ventral sclerotized cord or *tractium* (*tr*); this latter is frequently enlarged where it connects with the ligamentum, the enlarged portion forming a heel plate or *tangium* (*ta*). The apical portion forms the *lamnium* (*la*) which is divided by sutures into definite segments. The ventral margin of each segment usually forms a definite toothed *serrula* (*se*). Each *suture* (*s*) may bear a comb-like row of spines to form a *ctenidium* (*ct*), or a wing-like projection or *ala* (*a*). The ala usually terminates ventrad in a spur, the *alaspicula* (*ad*), and may bear small spines or *alaspinulae* (*ac*) on its free edge. Near the ventral margin there is frequently a definite spur, the *spiculella* (*sr*); between spiculella and alaspicula may be a group of *subalar spines* (*sa*). The sclerotized ventral border of the blade is the *sclerora* (*so*), which is traversed in each segment by one or more pores; a section of the sclerora between two pore groups may be termed an *abscissa* (*aso*). The membrane on the mesal side of the lancet usually forms a long crease, or *crepidium* (*cr*); frequently this terminates basally in a sclerotized tongue or *examium* (*ex*).

Study Techniques

Sawfly male genitalia and saws can be studied to the best advantage if removed from the specimen and cleared. For this, use specimens which have been killed dry, pinned, and allowed to harden for at least two weeks. These can be relaxed in a damp sand-carbolic acid relaxing chamber. The male genitalia may be extracted with a needle, the saws cut out with a pair of very fine optical scissors. With the saws, care must be taken to make the cuts at the extreme base of the saw in order to obtain a complete preparation. Preparations clear readily

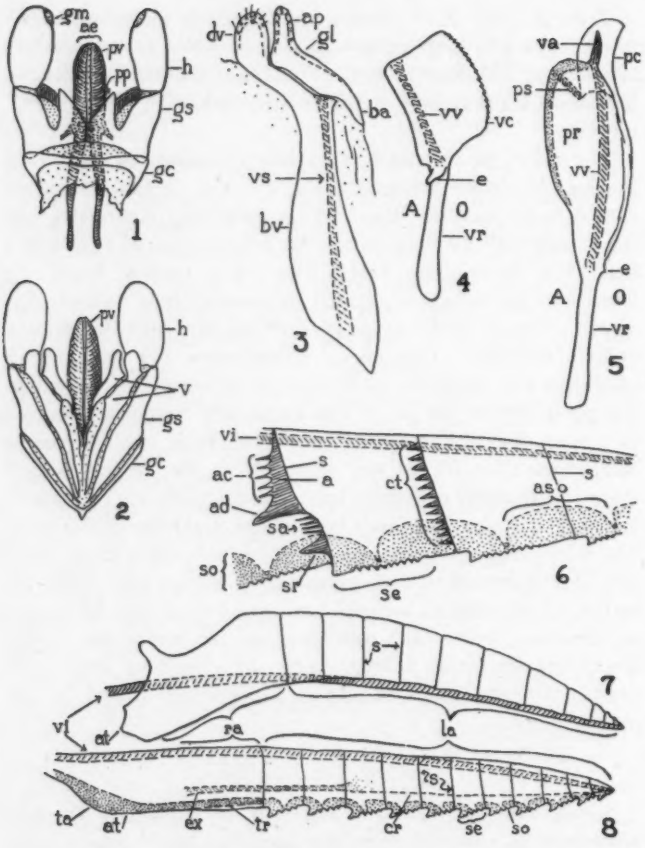

PLATE I

Hypothetical figures of sawfly genitalia

Fig. 1. Male genital capsule, primitively dorsal (abossicular) aspect.
Fig. 2. Male genital capsule, primitively ventral (ossicular) aspect.
Fig. 3. Volsella.
Fig. 4. Penis valve, simple type.
Fig. 5. Penis valve, Nematine type.
Fig. 6. Portion of lancet.
Fig. 7. Lance.
Fig. 8. Lancet.

in 5 per cent NaOH or KOH. Soaking for three to five hours in cold solution is usually sufficient. If this does not give adequate clearing, heat the clearing solution in a water bath for not more than five minutes. Clear only to the extent of removing muscle tissue, but not enough to cause marked desclerotization. Wash the preparation in distilled water and clean in 80 per cent alcohol.

Lancets and lances should be separated and mounted in Damar balsam as permanent slide mounts. It is necessary to have perfectly flat mounts of the lancets. Since the lances are frequently much thicker, it is desirable to mount the two lancets under one cover and the lances under another. Delicate saws should be stained; acid fuchsin has proven very satisfactory for this purpose. Male genital capsules and unusually thick lances may be studied in glycerin. In some cases it is advantageous to mount the penis valves as a permanent slide mount.

List of abbreviations

a—ala
ac—alaspinulae
ad—alaspicula
ae—aedeagus
ap—apiceps
aso—abscissa of sclerora
at—attachment point to valvifers or ligamentum
ba—basiura
bv—basivolsella
cr—crepidium
ct—ctenidium
dv—distivolsella
e—ergot
ex—examium
gc—gonocardo
gl—gonolacinia
gm—gonomacula
gs—gonostipes
h—harpes
la—lamnium
pc—pseudoceps
pp—parapenis
pr—paravalva
ps—paravalvar strut
pv—penis valve
ra—radix
s—suture
sa—subalar spines
se—serrula
so—sclerora
sr—spiculella
ta—tangium
tr—tractium
v—volsella
va—valvispina
vc—valviceps
vi—virgae
vr—valvura
vs—volsellar strut
vv—valvar strut

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New Syrphid Flies from Mississippi

By F. M. HULL, University of Mississippi

Several new species of Syrphids have been collected in Mississippi during the past year. This paper describes these species.

Mallota mississipensis n. sp.

Flies with the femora, the tarsi and hind tibiae wholly black, the male eyes rather widely separated, the thoracic pile reddish orange and the pile of the abdominal segment alternating yellow and black. Related to *illinoisensis*.

Male. Length 12 mm. *Head:* Eyes bare, the vertex shining brassy black, rather convex, the eyes separated by a distance between facets equal at least to the apical width of the second antennal segment in the lateral view. Pile of upper occiput and vertex light yellow, the frontal hair which arises from that part of the front above the narrowest portion is subappressed and directed upward and backward; pile of the lower front and face nearly white. Face with a shining middle stripe and the cheeks black. The sides of the face are widely yellowish white pubescent with abundant similar colored pile. The

three segments of the antennae wholly black, the arista quite short, about as long as the last two antennal segments, much thickened and reddish brown, the apex sharpened. *Thorax:* mesonotum black, overlaid with pale brownish yellow pollen and very dense, orange reddish pile. Ground color of the scutellum subtranslucent, light brownish yellow, its pile orange reddish. Squamae pale brownish yellow with orange brown border and yellowish fringe. Pleural pile thick, pale yellowish white. *Abdomen:* shining black, the pile of the first segment reddish yellow, upon the second segment brownish yellow except upon the apical fourth where it is black widely through the middle, almost to the sides. The third segment is similarly pilose, the black pile beginning in the middle about half way down the length of the segment and expanding outward as an obtuse triangle almost to the posterior corners. The fourth segment has similar black pile but beginning a little closer to the base. *Legs:* The femora are shining black with chiefly yellowish white pile. Upon the massively thickened hind femora there is some black pile at the extreme apex above and again subapically along the outside and extensively along the entire ventral and medio-ventral surface. The only light coloration upon the femora is the quite linear apical margin which is light brown. Anterior tibiae upon the basal fourth and middle tibiae upon the basal third light brown which quite diffusely shades into the remaining black part of these tibiae. Hind tibiae quite black including the knees. Tibial pile chiefly pale yellow with some black intermixed especially towards the apex on all three pairs. Hind tibiae considerably flattened. All of the tarsi wholly black and black pilose dorsally but with reddish yellow or brown pile ventrally. *Wings:* greyish hyaline, the veins upon the basal third yellowish brown, the third and fourth veins beyond the middle dark brown. There is a pale brownish cloud at the base of the submarginal cell extending above and below it and more faintly upon the end of the second basal cell. There is a very strong stigmal cross vein but the stigmal cell is greyish hyaline.

Holotype: a male, Oxford, Mississippi, March 11, 1945. (F. M. Hull collector.) Caught on wild plum blossom quite high up at the top of the tree. In Curran's key to *Mallota* species, this fly would go to *illinoisensis,* differing in the black legs and banded pile. I have compared it with specimens of *illinoisensis* before me.

Volucella anastasia n. sp.

A small blackish species with considerably reduced pattern and related to *fasciata* Macquart. There are no yellow spots upon the sternopleura or propleura.

Male. Length 6.5 mm. *Head:* Vertex black, the front widely yellowish along the eyes but shining sepia black on the anterior half before the antennae. The face is polished black with on either side a wide, pale yellow stripe which becomes attenuated and a little more brownish towards the sharply conical epistoma. The posterior part of the cheeks is divided by a narrow, obscure, reddish brown vitta; pile upon the black middle stripe black, upon the sides of the face brownish yellow. The antennae are sepia brown. The pile of the eyes is dense, long and blackish brown with some pale hair posteroventrally and a middle vertical band of denser blackish pile. *Thorax:* Mesonotum shining black with long thick pile which is chiefly black; there is some yellowish pile anteriorly before the suture. The humeri, and a diagonal, sublateral yellowish vitta which is divided by a crease and a much narrower posterior extension which lies beyond the suture and which is evanescent just before the post calli, are all pale yellow. There is a fairly large yellow spot on the posterior part of the mesopleura, a yellow spot on the metapleura immediate beneath the yellowish squamae and a tiny yellow spot diagonally below in front of it which may be upon the extreme upper part of the hypopleura. The scutellum is yellowish, the disc subtranslucent brown, the pile very thick and black. Just before the scutellum are a pair of tiny yellowish brown spots. Halteres with cream colored knobs. *Abdomen:* black, the second segment with a narrow, medial, quite widely separated yellowish brown fascia. Third

segment with a posteriorly indented fascia of the same color; the basal margin of the fourth segment is linearly yellowish brown, the posterior margin quite black; pile of the abdomen pale yellowish straw colored, black upon the hypopygium. Venter with a pair of basal, medially separated, subtranslucent yellowish spots which do not reach the sides; third strenite black, its extreme base linearly yellowish. *Legs:* black, first two segments of the first four tarsi and first three segments of the posterior tarsi reddish yellow; basal third of all of the tibiae and the apex of their femora yellow. Pile of legs black everywhere except upon the yellow segments of the tarsi where it is golden. Wings with a fasciate pattern similar to *fasciata* Macquart. The apex of the marginal cell is less protuberant and the brown of the wings a little more smoky.

Holotype: a male, University, Mississippi, May 30, 1944 (F. M. Hull collector).

Brachypalpus margaritus n. sp.

A large blackish fly, brassy yellow pile, distinguished from *oarus* Walker by the black tarsi, the black antennae and the spots on the cross veins and apex of wing. Length 9–12 mm.

Female. *Head:* Vertex and upper part of front shining bronze, the lower part of the front black with a slight brassy appearance; a small triangle of yellowish pubescence lies just above the antennae and there is a similar transverse band across the middle of the front. The face is deeply concave, shining brassy black, with a narrow band of yellowish pubescence from the antennae to the eye and a similar, slightly widening band from the lower part of the eye margin to the epistoma. All three segments of the antennae are wholly black, the arista thickened, orange brown basally, more yellowish apically. All the pile of the head yellow. *Thorax:* Mesonotum brassy black with four slender more or less opaque black vittae, the outer pair interrupted at the suture and these vittae narrowly margined with copper or bronze. The scutellum is brassy black. All of the thoracic pile is brownish yellow. Squamae yellowish white with yellow border and fringe; halteres light yellow-

ish brown. *Abdomen:* Broad, oval, wider than the thorax and shining black but slight brassy along the sides of the segments. The dense pile is erect and pale brownish yellow. *Legs:* The femora are black with a slightly brassy cast upon the hind pair which are rather thickened. The anterior and middle tibiae are brownish black except upon the basal fourth which is brownish yellow, and merges quite diffusely into the dark brown remainder. The hind tibiae are blackish; only the extreme base yellowish brown. All of the tarsi are black. The pile of the legs is brassy yellow, the hind femora with two or three rows of sharp, small, black spines upon the distal two-thirds of its length. *Wings:* Venation typical of *Brachypalpus;* the stigma is dark brown and there is a conspicuous dark brown cloud at the base of the submarginal cell spreading also above and below it and a similar brown cloud over the anterior cross vein and the end of the second basal cell. In addition, the apical fourth of the wing apex above the middle of the first posterior cell is rather strongly tinged with grey.

Holotype: a female, Oxford, MISSISSIPPI, March 10, 1945 (F. M. Hull collector). Caught on wild plum blossoms close to the ground. Paratypes: two females, March 11–13. Also on low blossoms of plum.

The Position of Epione mollicularia (Lep. Geometridae)

By WM. T. M. FORBES, Cornell University, Ithaca, New York

Epione mollicularia Zeller was described in the Verh. zool.-bot. Ges. Wien, xxxviii, 481, 1872, on the basis of a male from Boll (we presume from the vicinity of Dallas, Texas) in the Museum of Comparative Zoology. The Packard collection, now also in the M. C. Z., has a second male, probably of the same lot, though without locality or collector label, and the only other specimen I have seen is one in the American Museum of Natural History from Arkansas, about half as old. Zeller's placing was reasonable for the time, since then venational characters were not much used in the geometers, and the appearance

is closely like females of *E. apiciaria* and *parallelaria,* which still typify the genus. Hulst, in his generic revision of the Geometridae (Trans. Am. Ent. Soc., xxiii, 373, 1896), placed it in Hyperetis (which he misspelled Hyperitis) apparently on pure hunch, since he evidently had no data on the venation, and the wing form as figured by Packard (Monog. Phal., pl. 11, fig. 57) is not at all like Hyperetis. Perhaps the pink and yellow coloring, as in *H. nepiasaria,* suggested the reference. Barnes and McDunnough in the 1917 check-list mysteriously sunk it as a race of *H. amicaria,* in spite, again, of the totally different wing-form and pattern, and it still stands so in the new (1938) checklist.

In the meantime Grossbeck had received the Arkansas specimen, had recognized it, and set it aside as not a Hyperetis, and presumably a new genus, though the reference was never published.

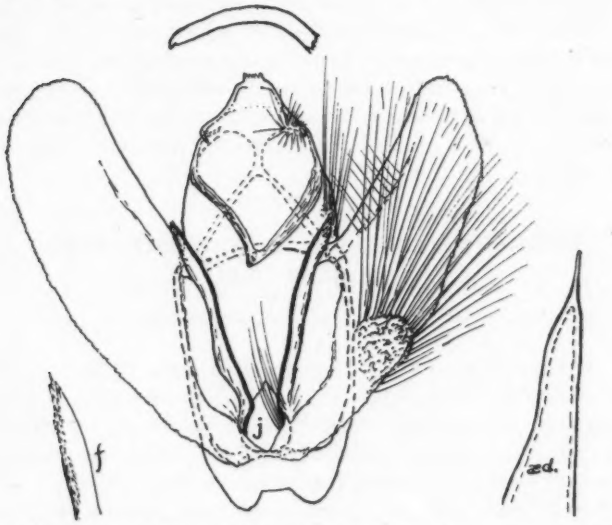
Recently I have been trying to clarify my ideas on the classification of the ennomid geometers, with the use of any new characters that could be found; and have studied the antenna (Psyche, xxxii, 106), the pupa (Jour. N. Y. Ent. Soc., liii, 177), the gena and chaetosema (in press) and most of all the male genitalic characters; in the latter case parasitizing my colleagues on a large scale, and specially Mr. Hahn Capps of the National Museum, and my own student Capt. J. G. Franclemont, now of the Southwest Pacific. I believe that true grouping characters are becoming clear, and so far as the present problem goes, think there can be defined a tribe *Anagogini,* based on the following characters:

Pupa with eight hooks on cremaster, with a setulose callosity marking the position of the first spiracle; without flange-plate, and with femur concealed. Imago with antenna pectinate; male genitalia (see figure) with juxta proper reduced to a deep cup, bearing a pair of long spinulose processes (the furcae); gnathos strong, beaked, with terminal spines which usually lie in a vertical row or longitudinal cluster; coremata usually present, located at the articulation of valve and vinculum, as normally when they occur in the Ennominae.

This group divides into two separate subgroups, one of the three closely related genera Anagoga, Plagodis and Hyperetis, the other a more varied remainder. The latter group are distinguished by the pupa, which has a deep denticulate groove between the 9th and 10th segments dorsally, and by the imaginal antenna which has the pectinations naked, attached to the segments basad of their middle, and extending within a segment or two of the apex. Most of the genera also have besides the usual two divergent apical setae on each pectinuation, a third seta on many of the pectinations of the anterior series, well back from their apices. These setae need fairly high power, but can be seen with 100 diameters of the binocular without mounting. The venation of the Anagoga group has a single trapezoidal accessory cell (the first) while the other group almost always has vein R_1 free, and frequently R_2 also, the second accessory cell, if either, being developed. The genera which concern us may be keyed as follows:

1. Radius arising by three roots from discal cell, the first two (R_1 and R_2) being normally entirely free.....2
   Radius arising by two roots only, R_2 being stalked on R_{3-5} *Cepphis* (*Priocycla*) and *Epione*
2. Fore wing with M_1 connate or stalked with R_{3-5} from upper angle of cell; a transparent discal lunule; antenna with apical and subapical setae only; ædœagus with strong cornuti .....*Selenia*
   Forewing with M_1 free, there being a short but distinct upper discocellular vein; no transparent discal lunule.....3
3. Tongue obsolete; antenna with apical and subapical setae only; ædœagus with strong cornuti; furcae short and close together .....*Slossonia*
   Tongue well developed; antenna with a lateral as well as apical setae on many of anterior pectinations; furcae arising from opposite sides of the pit-like juxta; ædœagus with cornuti only in *M. inatomaria*.....4
4. Thorax with smoothly imbricated scaling only; male genitalia with furcae reduced (*determinata*) or with cornuti on ædœagus (*inatomaria*), pupa strongly flattened. *Metanema*
   Thorax with normal vestiture, with hairs intermixed; male genitalia with well developed, usually unequal furcae, the ædœagus with terminal spine only and no cornuti. Pupa cylindrical .....*Metarrhanthis*

We may add that in Metarrhanthis, Cepphis and Epione, the wing form tends to be different, there being a strong tendency to have the teeth at veins R and M_1 of the hind wing strong with a deep concavity between, with the fore wing less strongly angled; while in the residue, the strongest angle is at M_3 of the fore wing.



Male genitalia of *Metarrhanthis mollicularia* Z.; with uncus drawn detached in side view. *j*, cup of juxta proper; *f* and *aed.*, apices of furca and ædœagus on a larger scale. The coremata lie behind the valve and the right one is shown as if by transparency.

Coming to *mollicularia;* this species shows all the characters of Metarrhanthis, so far as they appear on the male imago, including the fully pectinate antenna, with bristles on the anterior row of naked pectinations, radius arising by three roots, with the first two free, and the distinctive hind-wing form well marked. It is easily separated from any of our other species by the bright yellow median area of fore wing as well as basal area of hind wing; and in the genitalia by the long, slender and

equal furcae, as shown in the figure. It is evidently the most distinct species of the genus, and occupies the extreme southwest fringe of the humid Atlantic area, to which the genus is limited.

The coloring of the specimens suggests the possibility of a racial difference, since both the Texas specimens are clear yellow with bright rose shades on basal and outer areas, while the Arkansas one has a deeper and duller yellow and the rose area duller rusty; but this specimen was much fresher when caught, and the Texas ones are rubbed and possibly faded. The genitalic drawing is from the Packard specimen by courtesy of the staff of the M. C. Z.—since the type has lost most of its abdomen.

Food Preferences of the Cockroach, Blatta orientalis Linn.

By PHIL RAU, Kirkwood, Missouri

A dozen dome-shaped, wire cockroach traps (3 inches high by 6½ inches in diameter) had just been purchased, and while they were still new and clean, it was thought that they offered an opportunity to learn something of the food preferences of the cockroach. It seemed that a test of this kind could not safely be made with old contaminated traps, because the odor left by previous occupants would probably be the attractant, rather than the food itself.

Seven traps were therefore baited on May 13, placed in a row, six inches apart, on the floor of a moderately infested room, and observed for eleven days. The traps were baited as follows:

1—Fresh celery, stalks and leaves.
2—Hard-boiled egg, yellow and white.
3—Bacon.
4—Boiled potato.
5—Cinnamon bun.
6—Sliced banana, fruit and skin.
7—White bread.

It was found that the trap with bacon was completely ignored during the eleven days, for not one cockroach entered that trap. The hard-boiled egg, too, was unpopular, for only one roach was taken, and that one entered the trap only on the tenth night. Almost equally unpopular was the celery, for it attracted only two nymphs, and they came in on the eighth night. Banana was more popular, and lured the adults of both sexes into the traps on the eighth night. Cooked potato was much more in favor, and attracted 22 adults, the first ones (9 in number), however, not coming in until the sixth night, when the potato was becoming moldy. Plain white bread was more attractive, and caught 44 adults of both sexes, the first ones (11 in number) coming in on the third night of the experiment. The sugary, fragrant cinnamon bun, however, brought in 65 adults during the experiment, the first 29 of which also entered the trap on the third night.

To summarize, we find that in the experiments covering eleven nights, 144 roaches entered the traps in the following order:

Bait	No. of nights before first ones entered trap	Number
Cinnamon bun	Third night	65
Bread	Third night	44
Cooked potato	Sixth night	22
Banana	Eighth night	10
Celery	Eighth night	2
Boiled egg	Tenth night	1
Bacon	Eleventh night	0
	Total	144

We must therefore conclude that starchy foods are practically the entire choice of oriental cockroaches. It is also interesting to note that the longer time it took roaches to be drawn to a certain bait, the fewer were finally attracted to it.

Of course, it might be said that after the first few roaches had entered the traps, others followed, not by reason of the food odor, but because of the odor of the other roaches. In

order to test this, and also to know whether for experiments of this kind old, odorous traps are as good as new, clean ones, the following controls were set up.

Two traps were baited with live cockroaches, but without food; one trap contained seven adult females, and the other seven adult males. During this period of eleven nights, no roaches came to these traps; it is evident that roach odor is not an attractant, and the roaches that came into the traps did so in response to the lure of food. Also, it is evident that re-used, odorous traps would have given the same results in testing food preferences as did the new traps.

Notes and News in Entomology

Under this heading we present, from time to time, notes, news, and comments. Contributions from readers are earnestly solicited and will be acknowledged when used.

Sequel to the Rape of the Wasmann Collection of Ants: Dr. C. Willemse, of Eygelshoven, Holland, the noted Dutch Orthopterist, in a recent letter (November 18, 1945) passed on to me the most interesting and pleasing sequel to the story of scientific "schrecklichkeit" revolving around this famous collection. The following is quoted from his letter:

"The collections and libraries of all the museums in Holland are safe and had no damage. Perhaps you heard the story of the collection of ants of the late Rev. E. Wasmann. This collection was stored in a small provincial museum at Maastricht. . . . On a certain day there came Prof. Bischoff (a well-known hymenopterist) from Berlin, aided by Gestapo agents, and 'took' (= stole) this unique collection to Berlin, pretending that it was a German collection and that it was much safer in Berlin! About a month ago the collection happily returned to the museum (in Maastricht), brought back by one of your fine soldiers, Major Prof. Dr. J. W. Bailey, from the University of Richmond, who found where the collection was in Berlin and who loaded it on his jeep and brought it back to Maastricht. Honor to the U. S. Army!"—JAMES A. G. REHN.

How big is a group? There has been a good deal of argument as to what is the best size for a group, in the classification of insects, but I think little really serious thought. It seemed interesting to consider the idea that each step of subdivision should be (on the average, of course) equal, to make the most efficient classification. How large should the average group be, to carry out this idea?

Let us assume that there are a million (or perhaps 500,000) species in the class *Insecta*. Our classification uses commonly 11 steps, of which four are used everywhere, while the other seven are only utilized when finer subdivisions are needed to handle a larger number of species. These are: CLASS, Subclass, ORDER, Suborder, Superfamily, FAMILY, Subfamily, Tribe, GENUS, Subgenus, Species-Group, and SPECIES. There is one school of thought that refuses to admit any category between genus and species, save as a temporary expedient, but this point of view looks silly to the writer.

Calculate the 11th and 4th roots of 1,000,000 (or 500,000) and we get 3.50 (3.04) and 31.6 (21.2). It would appear, then, that the ideal size for a species-group would be between 3 and 4 species, a subgenus 3 or 4 species-groups, a genus 3 or 4 subgenera, and so on up the line. Or considering the species in a genus, the ideal number would appear to be about 20 or 30.

Actually, of course, the numbers in a proper classification would not be definite, but would vary enormously; but I think those workers who admit the use of subgenera and species groups are working closer to these figures than they realize.—Wm. T. M. Forbes.

Obituary

Dr. Jean Carl, Sub-director of the Museum of Natural History of Geneva, Switzerland, and an entomologist of distinction, died on June 7, 1944, we have been informed. He was born in 1877 and spent his entire life in zoological activities, from 1900 until his death in connection with the Geneva Museum. Dr. Carl's scientific publications number eighty-two

titles and dealt largely with entomology, particularly the Collembola and Orthoptera. His contributions to our knowledge of the isopods and diplopods were also of very great importance. He was deeply interested in zoogeographic problems, and in addition to important field work in his native Switzerland he conducted field researches in central Africa and southern India.

Dr. Ralph Henry Smith, professor of entomology and entomologist in the Agricultural Experiment Station of the University of California, died on September 22 at the age of fifty-seven years.

Dr. Theodore Henry Frison, the well-known hymenopterist, director of the Illinois State Natural History Survey since 1931, died on December 9. He was fifty years old.

Current Entomological Literature

COMPILED BY CHARLES HODGE IV, EDWIN T. MOUL, MAURICE E. PHILLIPS AND HENRY K. TOWNES JR.

Under the above head it is intended to note papers received at the Academy of Natural Sciences of Philadelphia and the University of Pennsylvania, pertaining to the Entomology of the Americas (North and South), including Arachnida and Myriopoda. Articles irrelevant to American entomology will not be noted; but contributions to anatomy, physiology and embryology of insects, however, whether relating to American or exotic species will be recorded.

This list gives references of the current or preceding year unless otherwise noted. Continued papers, with few exceptions, are recorded only at their first installment.

For records of Economic Literature, see the Experiment Station Record, Office of Experiment Stations, Washington. Also Review of Applied Entomology, Series A, London. For records of papers on Medical Entomology, see Review of Applied Entomology, Series B.

NOTE: The figures within brackets [ ] refer to the journal in which the paper appeared, as numbered in the List of Journals given at the end of the literature. The number of the volume, and in some cases, the part, heft, &c. is followed by a colon (:). References to papers containing new forms or names not so stated in titles are followed by (*); if containing keys are followed by (k); papers pertaining exclusively to Neotropical species, and not so indicated in the title, have the symbol (S).

Papers published in ENTOMOLOGICAL NEWS are not listed.

GENERAL—On interpreting Article 30 of the Code. Opin. & Declar. Intern. Com. Zool. Nomen. 2: 411–430. **Beall, G. & Williams, C. B.**—Geographical variation in the wing length of Danaus plexippus (Lep. Rhopalocera). [107] 20: 65–76. **Beaumont, J. de.**—L'Origine et l'évolution des sociétés d'insectes. [126] 52: 329–338. **Costa Lima, A. da.**—Insétos do Brasil. [Escola Nac. de Agron.

Sér. Didática] No. 7—1945, 379 pp. 5.° Tomo—Capítulo 28. **Curran, C. H.**—Insects in the House—The Fall Webworm. [128] 54: 332. **Curran, C. H.**—A camouflage artist among Caterpillars. [128] 54: 360–363, ill. **Curran, C. H.**—DDT. [Natural History.] 54: 401–405, ill. **Davis, W. T.**—Obituary. [10] 47: 230–235. **Frost, S. W.**—Insects feeding or breeding on Indigo, Baptisia. [6] 53: 219–225. **Ghilarov, M. S.**—Principal properties of injurious insects surviving to field crop rotation. [99] 47: 211–214. **Hemming, F.**—Importance of facsimile reproduction of rare works. Bull. Zool. Nomen. of Intern. Com. Zool. Nomen. 1: 119–120. **Jones & Piper.**—Insect photography with limited equipment. [65] 47: 275–282. **Kalmus, H.**—Correlation between flight and vision, and particularly between wing and ocelli, in insects. [107] 20: 84–96, ill. **Levene, H. & Dobzhansky, T.**—Experiments on sexual isolation in Drosophila. [41] 31: 274–281. **Minkiewicz, S.**—Obituary. [4] 77: 116. **Rosillo, M. A.**—Enumeracion de Insectos vinculados a la Economia de Entre Rios. [Memorias del Museo de Entre Rios] No. 22, Zoologia. 82 pp. **Seamans & Rock.**—Starvation of early instar of Agrotis orthogonia Morri, in control. [4] 77: 57–60. **Strickland, A. H.**—Survey of the Arthropod soil and litter fauna of some forest reserves and Cacao estates in Trinidad, British West Indies. [97] 14: 1–11. **Zikan, J. F.**—Considerações sôbre a Metamorfóse dos Insétos. Rio de Janeiro, 1944. 37 pp.

ANATOMY, PHYSIOLOGY, MEDICAL—Abbott, C. E.—Oviposition in Phaenicia (Lucilia) sericata Meig. [6] 53: 227–230. **Beament, J. W. L.**—Cuticulae lipoids of insects. [33] 21: 115–131, ill. **Buxton, P. A.**—Experiments with DDT in solutions and emulsions against mosquito larvae in West Africa. [22] 36: 165–175. **Canals, J.**—Descr. de n. gen. y esp. de opiliones de la subf. Pachylinae. [124] 8: 1–21, ill., 1943 (S). **Carter, W.**—Oral secretions of Pineapple Mealybug. [12] 38: 335–338. **Cockayne, E. A.**—Peroneural defect in Brenthis euphrosyne L. [21] 57: 109–110. **Cooper & Whitenall.**—An arsenic resistant tick. [31] 156: 450–451. **Dampf, A.**—Notas Sobre Pulgas I a VII. [35] 6: 47–70, ill. **DeMeillon, Goldberg & Lavoipierre.**—Nutrition of the larva of Aedes aegypti L. II. Essential water-solvent factors from yeast. [33] 21: 90–96. **Deoras, P. J.**—On the comparative morphology and evolution of adult Trichoptera. [123] 6: 35–48. **Dos Passos & Grey.**—A genitalic survey of Argynninae (Lepidoptera:

Nymphalidae). [40] 1296: 1–29, ill. **Geigy & Aboim.**—Gonadenentwicklung bei Drosophila nach frühembyonaler Ausschaltung der Geschlechtszellen. [126] 51: 410–417, ill. **Gibson, N. H. E.**—On the mating swarms of certain Chironomidae. [36] 95: 263–294. **Gloor, H.**—Phänokopie einer Letalmutante von Drosophila melanogaster. [126] 51: 394–402, ill. **Hadom & Graber.**—Über einen Drosophila-Stamm mit veränderten Spermatheken. [126] 51: 418–423, ill. **Kalmus, H.**—Correlations between flight and vision, and particularly between wings and ocelli in insects. [107] 20: 84–96. **Kennedy, J. S.**—Observations on the mass migration of desert locust hoppers. [36] 95: 247–262. **Lyman, F. E.**—Reactions of nymphs of Stenonema to light. [7] 38: 234–236. **Marlowe, R. H.**—Effect of foods on ovarian development in the melon fly. [12] 38: 339–340. **Muma, M. H. & Jeffers, W. F.**—Studies of the spider prey of several mud-dauber wasps. [7] 38: 245–255. **Nicholson, H. P.**—Morphology of mouth parts of non-biting blackfly, Eusimilium dacotense, cf. with biting species, Simulium venustum Say. [7] 38: 281–297. **Pal, R.**—Nephrocytes in some Culicidae. [123] 6: 143–148. **Park, T. & Davis, M. B.**—Further analysis of fecundity in flour beetles. [7] 38: 237–244. **Parkin, E. A. & Green, A. A.**—The toxicity of DDT to the housefly. [22] 36: 149–162. **Rakshpal, R.**—On the structure and development of the male reproductive organs in the Lepidoptera. [123] 6: 87–93. **Reiff, M.**—Fertilitätstypen bei Seliktionsstämmen, ihr Verhalten bei Kreuzungen und Transplantationsversuchen. Drosophila melanogaster. [126] 52: 155–211, ill. **Reiff, M.**—Fertilitätstyphen bei Selektionsstämmen von Drosophila melanogaster und ihr Verhalten bei Kreuzungen. [126] 51: 424–430. **Ris & Crouse.**—Structure of the salivary gland chromosomes of Diptera. [Proc. National Acad. Science] 31: 321–327, ill. **Sevastopulo, D. G.**—Effect of overcrowding larvae (Lepid.). [9] 78: 117–119. **Soenen, M. A.**—L'organe de Johnston des Diptera Brachyceres. [Annales Soc. Sci. de Bruxelles] 9–22, ill. **Webb, J. E.**—On the respiratory mechanism of Melaphagus ovinus L. (Diptera). [93] 114: 218–250, ill. **Wellington.**—Conditions governing distribution of insects in free atmosphere. [4] 77: 69–73. **Wigglesworth, V. B.**—Transpiration through the cuticle of insects. [33] 21: 97–114, ill. **Zikan, J. F.**—Considerations on the metamorphosis of insects. Rio de Janeiro, 1944, pp. 52, 14 pls.

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Chamberlin & Ivie.—Some Erigonid spiders of the genera Eulaira and Diplocentria. [Bull. Univ. Utah] 36: 3–19, ill. **Cloudsley-Thompson, Capt. J. L.**—Behaviour of the common centipede Lithobuis forficatus. [31] 156: 537–538. **Cooper & Whitnall.**—(See under Anatomy.) **Goodnight, C. J. & M. L.**—Phalangida from the U. S. [6] 53: 239–245 (*). **Hoff, C. C.**—The pseudoscorpion subfamily Olpiinae. [40] 1291: 1–30, ill. (k*). **Hoff, C. C.**—Two new pseudoscorpions of the genus Dolichowithius. [40] 1300: 1–7, ill. **Holm, A.**—Studien über die Entwicklung und Entwicklungsbiologie der Spinnen. [127] 19: 1–214, ill. **Holm, A.**—Über Gynandromorphismus und Intersexualität bei den Spinnen. [127] 20: 397–414, ill. **Kaston, B. J.**—New spiders in the group Dionycha with notes on other species. [40] 1290: 1–25, ill. **Kaston, B. J.**—New Micryphantidae and Dictynidae with notes on other spiders. [40] 1292: 1–14, ill. **Lawrence, R. F.**—A new parasite mite from the golden mole. [93] 114: 302–306, ill. **Mello-Leitão, C. de.**—Considerações sôbre o Genero Eusarcus Perty E Descrição de Quatro Novos Laniatores. [15] 37: 149–162, ill. (S). **Nevin, F. R.**—Immature forms of the mite Caeculus pettiti. [7] 38: 195–198. **Schubart, O.**—Alguns diplopodos novos do ceara colecionados por alcides L. Gomes. [125] 5: 275–281, ill. (*). **Smith, C. N.**—Biology of Ixodes dentatus Neum. [7] 38: 223. **Stahnke, H. L.**—Scorpions of the genus Hadrurus Thorell. [40] 1298: 1–9.

SMALLER ORDERS—Aubert, J.—Le Micropterisme chez les Plecopteres (Perlaries). [126] 52: 395–399. **Bonet, F.**—Nuevos Generos y Especies de Hipogastruridos de Mexico (Collembola). [35] 6: 13–45, ill. **Borror, D. J.**—Key to New World genera of Libellulidae. [7] 38: 168–194. **Carpenter, F. M.**—Panorpidae from China. [5] 52: 70–78. **Emerson, A. E.**—The neotropical genus Syntermes (Isoptera: Termitidae). [62] 83: 433–471. **Jordan, H. E. K.**—On the deciduous frontal tubercle of some genera of Siphonaptera. [108] 14: 113–116. **Koch, M.**—Zygaena Fab. Mitteil. d. Münchner Ent. Gesell. 34: 66–81. **Light & Illig.**—Rate and extent of development of Neotenic Reproductives in groups of nymphs of the termite genus Zootermopsis. [Univ. of Cal. Pub. in Zoology] 53: 1–40. **Salmon, J. T.**—Notes and synonymy on some Generic names of the Collembola. [Trans. Royal Soc. of New Zealand] 75: 68–71. **Werneck, F. L.**—Note on Linognathus cervicaprae. [111] 41: 233–235. **Werneck, F. L.**—Mallophaga from the Andes. [111] 41: 257–261. **Williner, G. J.**—Dos

nuevos corrodentidos de Cordoba. [124] 9: 445–452, ill., 1944.

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logie des männlichen Kopulations-apparates bei den Capsiden (Rhynchota). [127] 20: 415–430, ill. **Lizer y Trelles, C. A.**—La coleccion Coccidologica de Pedro Jorgensen. [124] 7: 69–80, ill., 1942 (*S). **Lizer y Trelles, C. A.**—Descr. de cuatro psilidos filocecidogenos. [124] 8: 151–165, ill., 1933 (*S). **Maltais, J. B.**—Simple method of mounting aphids on Microscope slides. [4] 77: 103–104. **McAtee, W. L. & Malloch, J. B.**—Identity of Tetyra lateralis Fab. [10] 47: 212–213. **McKenzie, H. L.**—Revision of Parlatoria and closely allied genera (Homoptera: Coccoidea: Diaspididae). [117] 10: 47–121, ill. (K*). **Metcalf, Z. P.**—Fulgoroidea (Homoptera) of Kartabo, Bartica District, British Guiana. [18] 30: 125–143. **Monte, O.**—Tres novos Tingitideos. [105] 16: 249–251. **Palaez, D.**—Estudios sobre Membracidos. V. Las especies Mexicanas del genero Sphongophorus Fairmaire (Hemiptera-Homoptera). [102] 4: 53–146, ill. **Torre-Bueno, J, R. de la.**—Random notes on Thasus acutangulus. [19] 40: 83. **Torres, B. A.**—Algunas interesantes alteraciones en el pan de la nerviacion alar en Cicadidae. [124] 6: 519–530, ill., 1941. **Torres, B. A.**—Sobre un n. gen. y cuatro n. esp. del gen. Tettigades (Cicad.). [124] 7: 253–263, ill. (S). **Torres, B. A.**—Sobre la supuesta variacion de Tettigades chilensis y cinco n. esp. del genero citado (Cicadid). [124] 9: 453–74, ill., 1944 (S). **Wygodzinsky, P.**—Two new species of Ploiaria and Rothbergia. [105] 16: 244–248. **Wygodzensky, P.**—Notas e descricoes de "Emesinae" Neotropicais (Reduviidae: Hemiptera). [125] 5: 247–262.

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Review

BRAZIL, ORCHID OF THE TROPICS. By Mulford and Racine Foster. Jaques Cattell Press. 6 + 308 pp. Illus. Index. $3.00.

This book is an interesting account of two expeditions made to southern and southwestern Brazil by the authors to collect bromeliads and orchids, both as living and herbarium specimens. These two groups of plants are particularly difficult to dry, because of their fleshy structure, and the authors were remarkably successful in getting good herbarium preparations. Many species were successfully transplanted to the Fosters' orchidarium in Florida but also many were killed by Government fumigation on entry. Their descriptions of the wealth of beautiful bromeliads, including many new species, are vivid and enthusiastic. There are numerous good accounts of the collecting localities, which would have been more valuable if a detailed and adequate map of the region studied had been included. References to insects and other animals are few and rather general, so that the book will hardly serve as a guide to zoological collecting, but enough is said of the tenants of bromeliads to show how much is still to be learned about them. There are 137 black and white photographs, four beautiful kodachromes and 32 line drawings.

This is a fascinating narrative of "botanizing" in a little-known part of a country that has always beckoned naturalists.—AMELIA S. CALVERT.

EXCHANGES

This column is intended only for wants and exchanges, not for advertisements of goods for sale or services rendered. Notices not exceeding three lines free to subscribers.

These notices are continued as long as our limited space will allow; the new ones are added at the end of the column, and, only when necessary those at the top (being longest in) are discontinued.

Lepidoptera—Am still collecting here and have only fine specimens for exchange. H. W. Eustis, Woodbine Rd., Augusta, Ga.

Wanted—Viennese Entomological Printing Press, for printing 3, 3½ and 4 type data labels. Kent H. Wilson, 430 Ridgewood Road, Fort Worth 7, Texas.

Wanted—Heteroptera from all parts of the world, all families except Miridae. Will buy, exchange or determine. S. and C. Amer. species esp. desired. John C. Lutz, 6623 Lansdowne Ave., Philadelphia 31, Pa.

Wanted—Mosquitoes for determination, or exchange for S. E. specimens. Particularly desire larvae. H. R. Dodge, Box 1095, Macon, Ga.

Arctic Lepidoptera on hand, including Erebia, Oeneis and Brenthis. R. J. Fitch, Lloydminster, Sask., Canada.

Odonata—Will buy or exchange North and Central American species, both imagos and nymphs. Also will exchange other orders for Odonata. Carl Cook, Crail Hope, Kentucky.

I want to collect Rothschildia farbesi, agapema, galfina and io moths for interested persons. E. Frizzell, Route 4, San Benito, Texas.

Wanted—Information as to the existence and present location of a copy of Solodonikov, S. V. Contribution à l'étude de la faune et de la biologie des larves des Libellules du Donetz et de certains de ces affluents. [In Ukrainian.] Trav. Soc. Nat. Charkow 52: 249–268. 1929. [Quoted from Zool. Rec. 1936, Ins. p. 147, No. 3114.] P. P. Calvert, P. O. Box 14, Cheyney, Penna.

Wanted—Crane-flies (Tripulidae) of New Guinea, New Caledonia and Neighboring Islands, for revisional purposes. Also, names and addresses of individuals or institutions possessing any of these flies. Correspondence solicited. Chas. P. Alexander, Fernald Hall, Amherst, Mass.

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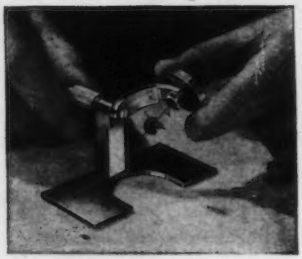

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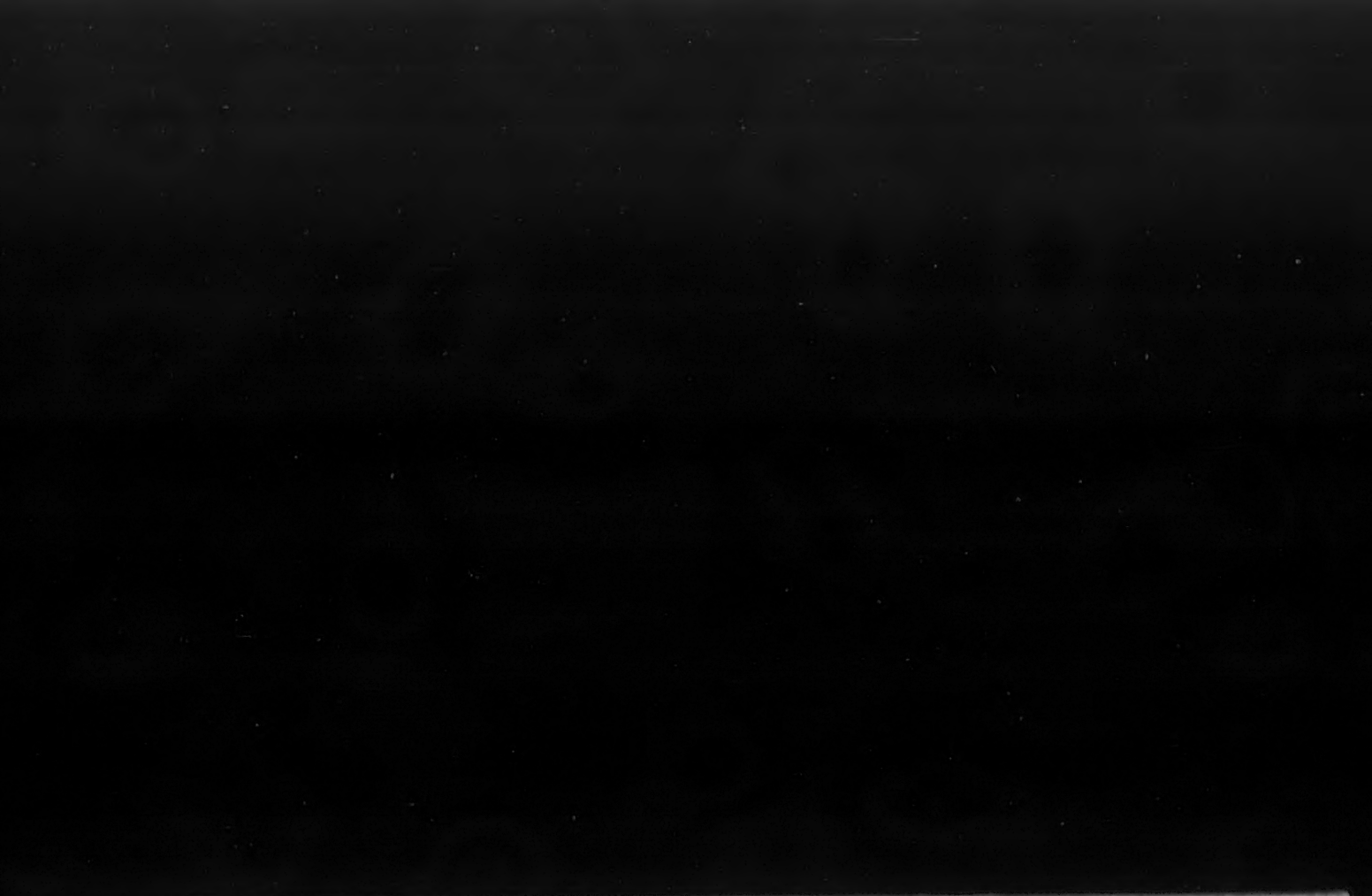
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